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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/421,437 10/19/99 CHAPMAN

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EXAMINER

MMC2/0711

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THOMPSON, A

ART UNIT

PAPER NUMBER

2825

DATE MAILED:

07/11/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/421,437

Applicant(s)

CHAPMAN, DAVID C.

Examiner

A. M. Thompson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 10-35, 39-53, 57-67 is/are rejected.
- 7) ☒ Claim(s) 7-9, 36-38 and 54-56 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 23 April 2001 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Applicant's Amendment and Response to application, serial number 09/421,437, has been examined and reviewed. Claim 35-67 are added. Claims 11, 12, 24 and 29 are amended. Claims 1-67 are pending.

1. Applicant's Amendments and Remarks have been carefully reviewed and considered partially persuasive. Allowable subject matter is now indicated. Any pertinent rejections from the previous office action are incorporated herein.

Drawings

2. Applicant's amendments obviates the prior objections.

Claim Objections

3. Applicant's amendments to Claim 29 obviates the prior objections. Examiner finds Applicant's response regarding claim 29 persuasive and withdraws the prior objection.

4. Claims 35 and 53 are objected to because of the following informalities: Pursuant to Claim 35, at line 6, after "one", insert --or--; pursuant to claim 53, at line 5, after "one", insert --or--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Applicant's amendment obviates the rejection under this code section.

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Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Rejection of Claims 1-6, 10-20, 22, 24-34

8. **Claims 1-6, 10-20, 22, 24-35, 39-53, 57-67** are rejected under 35 U.S.C. 103(a) as being unpatentable over the Thorsten Adler et al. paper ("the Adler paper") entitled An Interactive Router for Analog IC Design. Adler discloses an interactive two-layer router for an analog integrated circuit. Adler does not use the term "routing indicators" to define the flags which determine routing changes. However, Adler does use tunnel polygons, wave propagation and integer bit flags to control routing layout changes. It would have been obvious to one of ordinary skill in the art at the time of applicant's invention that Adler's methods involve the use of routing controls equivalent to Applicant's routing indicators.

Pursuant to Claim 1 which recites a method for automatically routing an integrated circuit: the Adler paper discloses an interactive, automatic router; Abstract and §1;

receiving integrated circuit layout data that defines a set of two or more integrated circuit (IC) devices to be included in the IC: §2 defines two IC objects, a source (S) and a target (T);

receiving integrated circuit connection data that specifies one or more electrical connection to be made between the IC devices: §3.1, the database contains the connection information;

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determining a set of one or more routing indicators that specify a set of one or more preferable intermediate routing locations through which a routing path is to be located to connect first and second IC devices: §3.1 which disclose the integer bits 21 and 29; additionally, this section discloses the use of a flag to indicate acceptable directions;

determining from the IC connection data and the set of one or more routing indicators the routing path between the first and second integrated circuit devices: §3.3 discloses path determination;

updating the IC layout data to generate updated IC layout data that reflects the routing path between the first and second IC devices: §3.4 discloses the updating and generation of final routing path data.

Pursuant to Claim 2, wherein determining the routing path includes determining based upon the IC layout data, the integrated circuit connection data (§2.4 and §3.3), bias direction criteria, §3.4, and straying limit criteria § 3.1-3.4, the routing path between the first and second integrated circuit devices, §3.3.

Pursuant to Claim 3, wherein determining the routing path between the first and second IC includes identifying one or more obstacles that block the routing path: §3.1 discloses obstacle polygons that yields unusable space;

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determining indicators that specify one or more preferable routing locations through which the routing path is to be located to avoid the one or more obstacles: §3.4; see also § §3.1-3.3;

determining. . .the routing path between the first and second integrated circuit devices: §3.4.

Pursuant to Claim 4, which recites identifying obstacle that block the routing path: §3.1 discloses the use of obstacle polygons;

changing specified straying criteria. . .: §§2.2 and 2.2.1 discloses routing path widths;

determining. . .the routing path between the first and second integrated circuit devices: §3.4.

Pursuant to Claim 5 which recites identifying obstacle that block the routing path: §3.1 discloses the use of obstacle polygons;

determining a set of one or more layer changes to allow the routing path to avoid the one or more obstacles: §3.1 discloses two level routing and an intermediate layer that Ors together level 1 and level 2 layers;

determining based upon the IC data, the IC connection data, the set of routing indicators, and the set of one or more layer changes, the routing path between the first and second integrated circuit devices: §§3.3-3.4.

Pursuant to Claim 6, which includes the limitation of determining a set of one or more bends to be included in the routing path to avoid the one more obstacle: §2.2.1.

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Pursuant to Claim 10, which recites identifying one or more obstacles that block the routing path: §3.1 discloses the use of obstacle polygons;

determining . . . the routing path between the first and second integrated circuit devices: §3.3 discloses path determination.

Pursuant to Claims 11 which includes the additional limitations of determining one or more locations to employ corner clipping to provide additional space for routing the routing path: The Adler paper teaches global and maze routing which suggests corner clipping, and includes design rule modifications and routing paths of various degree angles, §§2.2 and 2.2.1;

Pursuant to Claim 12-14, Adler discloses the additional limitations of determining one or more integrated circuit layout objects to be moved to provide additional space for routing and examining data with layout changes, etc: Adler, §§1-5.

Pursuant to Claim 15, which includes the limitation of determining routing targets: Adler, §§1-5.

Pursuant to Claims 16-20, these claim include the limitation of design rule checking of routing paths and defined attachment or bend angles that are multiples of ninety degrees: Adler, Figs. 1, 2; §§2.1-2.2.2; Abstract.

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Pursuant to Claim 22, which includes the limitation of determining. . . a set of two or more join points that are to be electrically connected, wherein each join point from the set of two or more join points has an associated set of specified design criteria that control attachment of routing paths: Adler, §§ 2.2 - 2.4.

Pursuant to Claims 24-28, they address the limitations previously rejected in Claims 1-5, supra and are likewise rejected using the same rationale. Claims 24-28 include the additional limitation of a computer-readable medium having instructions for automatically routing a circuit which is executed by one or more processors. The Adler paper discloses that its method is performed on a Mentor Graphics' ICstation and its algorithms are implemented using the programming language C++. The Adler paper does not specifically disclose a computer-readable medium but it would have been obvious to one of ordinary skill in the art at the time of applicant's invention that the use of an ICstation would also include the use of computer-readable media as part of the process of implementation. See Adler, §4. Because the Adler paper also addresses the computer-readable media limitation, Claims 24-28 are unpatentable over the Adler paper.

Pursuant to Claims 29-33, they address the limitations previously rejected in Claims 1-5, supra and are likewise rejected using the same rationale. Claims 29-33 include the additional limitation of a system for automatically routing an integrated circuit. This limitation is also addressed by the Adler paper's disclosure of the Mentor Graphics' ICstation.

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Pursuant to Claim 34, wherein each routing indicator from the set of one or more routing indicators specifies a routing direction for the routing path: §3.1 discloses an integer value wherein bits 21 to 29 store information about routing direction and bits 31 and 30 are used to mark grid points inside source or target polygons.

Pursuant to Claims 35 and 53, these claims address the limitations already rejected in claim 6 and are likewise rejected using the same rationale. The additional limitation of a computer-readable medium and a system are within the scope of the prior art references which teach CAD systems.

Pursuant to Claims 39 and 57, these claims address the limitations already rejected in claim 10 and are likewise rejected using the same rationale.

Pursuant to Claims 40 and 58, these claims address the limitations already rejected in claim 11 and are likewise rejected using the same rationale.

Pursuant to Claims 41 and 59, these claims address the limitations already rejected in claim 12 and are likewise rejected using the same rationale.

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Pursuant to Claims 42 and 60, these claims address the limitations already rejected in claim 13 and are likewise rejected using the same rationale.

Pursuant to Claims 43 and 61, these claims address the limitations already rejected in claim 14 and are likewise rejected using the same rationale.

Pursuant to Claims 44 and 62, these claims address the limitations already rejected in claim 15 and are likewise rejected using the same rationale.

Pursuant to Claims 45 and 63, these claims address the limitations already rejected in claim 16 and are likewise rejected using the same rationale.

Pursuant to Claims 46 and 64, these claims address the limitations already rejected in claim 17 and are likewise rejected using the same rationale.

Pursuant to Claims 47 and 65, these claims address the limitations already rejected in claim 18 and are likewise rejected using the same rationale.

Pursuant to Claims 48 and 66, these claims address the limitations already rejected in claim 19 and are likewise rejected using the same rationale.

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Pursuant to Claims 49 and 67, these claims address the limitations already rejected in claim 20 and are likewise rejected using the same rationale.

Pursuant to Claim 50, this independent claims addresses the limitation already rejected in claim 1 and is likewise rejected using the same rationale. The additional limitation of a computer-readable medium is within the scope of the Adler paper which teaches a Mentor Graphics' IC station.

Pursuant to Claims 51 and 52, these claims address the limitations already rejected by claims 22 and 23, respectively, and are likewise rejected using the same rationale. The additional limitation of a computer-readable medium is within the scope of their respective prior art references which disclose CAD systems.

Rejection of Claim 21

9. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over the Suzuki et al. paper ("the Suzuki paper") entitled A Practical Online Design Rule Checking System. The Suzuki paper discloses a method for verifying an IC layout using a design rule checking system. The Suzuki paper's incremental DRC method does not restrict the number of design rule checks to two. However, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention that because the Suzuki paper's incremental DRC method includes the possibility of one or more DRC's, applicant's "second design rule check" limitation is within the scope of the Suzuki

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paper. Pursuant to Claim 21, Suzuki discloses an automatic, incremental and iterative (to enable a second design rule check) design rule check system, §§2-3.2.

Rejection of Claim 23

10. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Xiong, U.S. patent 5,550,748. Xiong discloses a system and method for delay routing and signal net matching. Xiong does not explicitly teach the step of updating the IC layout data after changes are made. However, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention that the process of routing and rerouting as disclosed by Xiong would necessarily include updating the IC layout. Pursuant to Claim 23, the limitations of this claims are addressed by Xiong, Figs. 3, 4; Xiong, col. 2, line 44 to col. 3, line 13.

Allowable Subject Matter

11. **Claims 7-9, 36-38, and 54-56** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter: The prior art does not disclose a method of determining a routing path that includes identifying one or more obstacles that block the routing path, and determining one or more portions of the routing path to be ripped up and rerouted.

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Remarks

Claim 1: Applicant asserts that the prior art does not teach or suggest the limitation “a set of one or more routing indicators that specify a set of one or more preferable intermediate routing locations through which a routing path is to be located”: In Adler, the routing indicators are flags and integer bits. According to § 3.1, the bits and the flags determine acceptable directions e.g. which directions are forbidden. Therefore Adler’s routing indicators do specify a preferable routing location/direction. The wave, contrary to Applicant’s assertions, do determine a path; § 3.3 : “After the wave has reached the target polygon *the path from source to target . . . can be determined.*” Adler also teaches in § 3.3 the limitation “determining from . . . the set of one or more routing indicators. . . the routing path between the first and second integrated circuit devices.” § 3.3 discloses the routing of connections between end points. The end points would be considered a first and second integrated circuit devices.

Claim 2: Adler teaches or suggests straying limit criteria and bias direction criteria. In the specification, Applicant states that a straying limit is used to define a region within which a new wire may be routed to connect a starting join point to an ending point. §§3.1-3.4 discusses and illustrates regions of the layout in which new wire may be routed. Applicant’s specification also states that a bias direction is used to specify a general direction that a wire should follow during detailed routing to reach a specified ending join point. § 3.4’s Figure 8 in which the wires are routed to the right and to the left suggests bias direction.

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Claim 3: The obstacles relate to unusable space and Adler discusses this limitation in § 3.1. Applicant contends that Adler only briefly mentions obstacles. Nevertheless, this is sufficient to satisfy the limitation of identifying one or more obstacles that block the routing path.

Claim 10: Adler identifies obstacles and determines a routing path. This is disclosed in § 3.1.

Claim 16: Applicant states that the limitations of this claim require on-the-fly design rule checking. Examiner does not read this limitation in the claim. Claim 16 merely require design rule checks on routing paths and Adler suggests this limitation by disclosing the existence of special distance rules in the AR router. The distance rules would be the design rules.

Claim 22: Adler discloses connection points which may be considered join points. They are illustrated in Figure 5 and discussed in § 2.4.

Claim 21: Suzuki discloses in § 2.1 that each time an incremental DRC is run, a selected design rule may be set on or off for the particular DRC run. So, the design rule values are *changed* from one design rule check to another depending on what design rule is selected. Examiner therefore maintains the rejection of this claim as obvious over the Suzuki reference.

Claim 23: The limitation “determining whether the distance to be routed for a portion of the routing path exceeds a specified distance, and if the distance to be routed for the portion of the routing path does not exceed the specified distance, then routing the portion of the routing path in a single step” is suggested in Xiong, col. 2, line 44 to col. 3, line 13. Xiong teaches setting a “net length constraint to the length of a longest routed path.” This constraint addresses the “specified distance” limitation.

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Nets are then rerouted in accordance with net length constraint. Based on the foregoing, Examiner maintains the rejection of Claim 23 as obvious over Xiong.

Claims 24-28: These claims address limitations previously rejected in Claims 1-5, supra. Examiner maintains the rejection of these claims using the same rationale.

Claims 29-33: These claims address limitations previously rejected in Claims 1-5, supra. Examiner maintains the rejection of these claims using the same rationale.

Claim 34: This claim addresses limitations previously rejected in Claim 1. Examiner maintains the rejection of this claim using the same rationale.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Please see PTO-892 for a complete listing.

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

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calculated from the mailing date of the advisory action. In no event will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A.M. Thompson whose telephone number is (703) 305-7441. The examiner can usually be reached Monday thru Friday from 8:00 a.m. to 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith, can be reached on (703) 308-1323. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3431.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782 or the Customer Service Center whose telephone number is (703)306-5631.

16. Responses to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 305-3431, (for formal communications intended for entry)


(for informal or draft communications, please label "PROPOSED" or "DRAFT")

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Hand-delivered responses should be brought to Crystal Plaza 4, 2021
South Clark Place, Arlington, VA., Fourth Floor (Receptionist).



A.M. THOMPSON
JULY 4, 2001



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